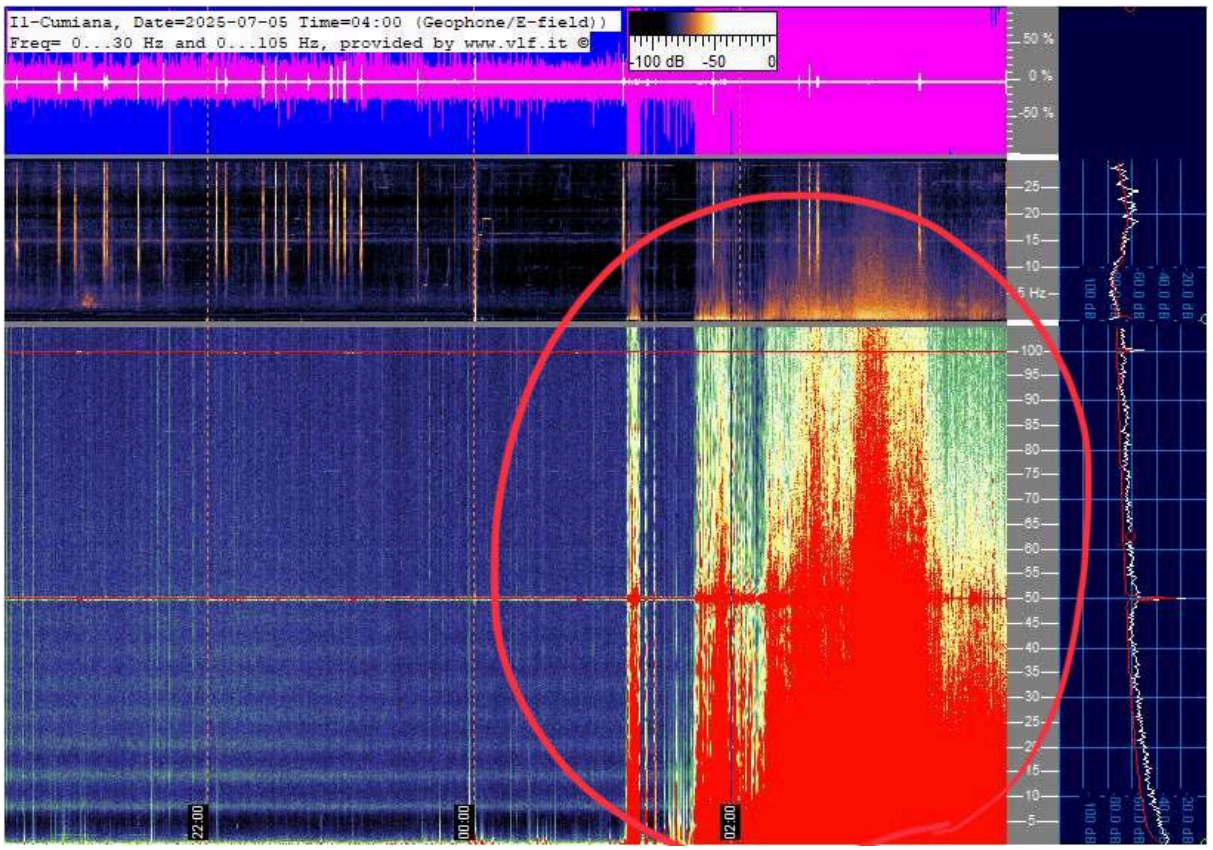
Hydrogen Energy Development Fund
Operated & managed by Secure Supplies Investments limited
fueling healthy communities

2025 Rectenna EXTREME ADVANCED APPLICATIONS



Tuning a rectenna to the Schumann resonance, particularly in the context of the reported activity from Cumiana, Italy, blasting over 100 Hz, involves several technical considerations. A rectenna (rectifying antenna) is designed to capture electromagnetic energy and convert it into usable DC power, often used in wireless power transfer or energy harvesting systems. The Schumann resonances are global electromagnetic resonances in the Earth-ionosphere cavity, typically occurring at extremely low frequencies (ELF) around 7.83 Hz (fundamental), 14.3 Hz, 20.8 Hz, 27.3 Hz, and 33.8 Hz, with weaker harmonics extending higher.

The reported "over 100 Hz" activity is unusual, as Schumann resonances are generally below 60 Hz, suggesting either an extraordinary event, measurement artifact, or misinterpretation of the data.
Here's a step-by-step guide to tuning a rectenna for Schumann resonance energy harvesting, with considerations for the Cumiana report and Secure Supplies' context:

I present this to you with the trust know that you now know it
And you will Protect it, build it and share it privately home to home.

Daniel Donatelli

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

1. Understand the Schumann Resonance and the Cumiana Report

- **Schumann Resonance Basics**: These are natural electromagnetic waves excited primarily by lightning discharges in the Earth-ionosphere waveguide. The fundamental frequency is approximately 7.83 Hz, with harmonics at 14.3, 20.8, 27.3, and 33.8 Hz. Higher frequencies (e.g., >100 Hz) are not typically associated with Schumann resonances but could indicate local electromagnetic activity, interference, or a unique event.
- **Cumiana Monitoring Station**: Located in northwest Italy (44.96° N, 7.42° E), this station measures very low frequency (VLF) and extremely low frequency (ELF) signals, including Schumann resonances, using a Marconi antenna for electric fields and induction coils for magnetic fields. The report of "blasting over 100 Hz" at 12:41 AM EST on July 5, 2025, is anomalous, as Schumann resonance measurements typically focus on 3–100 Hz. This could reflect a spike in local electromagnetic activity or a measurement error.
- **Secure Supplies Context**: Secure Supplies is a company focused on energy solutions, including hydrogen and power systems. Their rectennas might be designed for energy harvesting, but specific details about their rectenna designs are not publicly available in the provided context. Assume a generic rectenna design for ELF/VLF energy harvesting.

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

2. Design Considerations for the Rectenna

To tune a rectenna to Schumann resonances, you need to optimize its antenna and rectification circuit for ELF frequencies, which are challenging due to their long wavelengths (e.g., 7.83 Hz corresponds to a wavelength of ~38,000 km).

- **Antenna Design**:
  - **Type**: Use a large loop antenna or a long wire antenna (e.g., Marconi-type dipole, as used in Cumiana) to capture the electric or magnetic field components of Schumann resonances. Loop antennas are better for magnetic fields, while dipoles suit electric fields.
  - **Size**: ELF wavelengths are massive, so a full-wavelength antenna is impractical. Instead, use a small loop or dipole with high sensitivity, tuned with a resonant circuit. For example, a 60 cm induction coil pair, as described in some ELF receivers, can work.
  - **Tuning**: The antenna must resonate at the target frequency (e.g., 7.83 Hz or higher harmonics). This requires a high-inductance coil (e.g., 100,000 turns of copper wire) and a capacitor to form an LC resonant circuit. The resonant frequency is given by:
  - `f = \frac{1}{2\pi \sqrt{L C}}`
  - where (L) is inductance (Henries) and (C) is capacitance (Farads). For 7.83 Hz, you might need a large inductor (e.g., 10 H) and a capacitor (e.g., 0.1 μF).
  - **100 Hz Consideration**: If targeting the reported 100 Hz activity, recalculate the LC values. For 100 Hz, a smaller inductance (e.g., 1 H) and capacitance (e.g., 2.53 μF) may suffice. Verify the Cumiana data, as 100 Hz is outside typical Schumann resonance bands.
- **Rectification Circuit**:
  - **Diode Selection**: Use Schottky diodes with low forward voltage drop for efficient rectification of weak ELF signals. The Schumann resonance electric field amplitude is ~300 μV/m, and magnetic field amplitude is ~1 pT, so high sensitivity is critical.
  - **Amplification**: Include a low-noise preamplifier (e.g., OPA209 with 2.88 nV/√Hz noise at 10 Hz) to boost the signal before rectification. The Cumiana station uses high-impedance amplifiers for its Marconi antenna.
  - **Filtering**: Use a bandpass filter (3–100 Hz) to isolate Schumann resonance frequencies and reject noise (e.g., 50/60 Hz power line interference). For 100 Hz, adjust the filter to include this frequency, but confirm its relevance.
- **Capacitor Banks for Power Storage**:
  - The rectenna's output will be low (microwatts to nanowatts) due to the weak Schumann resonance signals. Use ultra-low-leakage capacitors (e.g., supercapacitors) to store energy. A bank of 1 F capacitors rated for 5 V can accumulate charge over time.
  - Include a charge management circuit to prevent overcharging and ensure efficient energy transfer to the load.

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

3. Tuning the Rectenna

To tune the rectenna to Schumann resonances, follow these steps:

- **Select Target Frequency**:
  - Start with the fundamental Schumann resonance at 7.83 Hz or harmonics (14.3, 20.8, 27.3, 33.8 Hz). If aiming for the reported 100 Hz, verify its source, as it may not be a Schumann resonance but a local VLF event. Check real-time data from Cumiana (e.g., via www.vlf.it) or other stations like the HeartMath Institute's Global Coherence Monitoring System.
  - Use a spectrum analyzer or software-defined radio (SDR) to confirm local Schumann resonance activity.
- **Adjust the LC Circuit**:
  - Calculate the required inductance and capacitance for resonance at the target frequency using the formula above.
  - Use a variable capacitor or inductor to fine-tune the circuit. For example, a 100 K linear taper trim pot can adjust the circuit for precise resonance.
  - Test the resonance by measuring the antenna's output with an oscilloscope or multimeter in a low-noise environment.
- **Optimize the Antenna**:
  - Position the antenna away from man-made electromagnetic interference (e.g., power lines, which can reduce Schumann signal strength by 10x).
  - Orient the antenna to maximize signal capture: loop antennas should be perpendicular to the magnetic field, and dipoles should align with the electric field.
- **Amplify and Filter**:
  - Use a low-noise amplifier with a gain of 86–112 dB at 10 Hz, as used in portable ELF receivers.
  - Apply a bandpass filter to focus on 3–100 Hz, adjusting the upper limit if targeting 100 Hz.
- **Rectify and Store Energy**:
  - Connect the rectified output to a capacitor bank via a charge controller. Monitor the charging rate, as Schumann resonance energy is weak, requiring long integration times.
  - Use a DC-DC converter to step up the voltage for practical use, if needed.

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

4. Challenges and Considerations

- **Weak Signal Strength**: Schumann resonance signals are extremely weak (~300 μV/m electric, ~1 pT magnetic), making energy harvesting inefficient without large antennas and high-gain amplifiers.
- **100 Hz Anomaly**: The Cumiana report of “blasting over 100 Hz” is not typical for Schumann resonances. It could indicate:
    - Local electromagnetic interference (e.g., from cars or equipment near the sensor).
    - A rare event like a volcanic eruption or ionospheric disturbance, as seen with the Tonga volcano in 2022.
    - A data blackout or measurement error, as Cumiana has experienced data issues in the past.
    - Verify with other stations (e.g., Sos Enattos, Italy, or HeartMath’s network) before tuning to 100 Hz.
- **Environmental Noise**: Power lines, electronics, and human activity can overwhelm Schumann signals. Deploy the rectenna in a remote area, as suggested for ELF receivers.
- **Secure Supplies Specificity**: Without detailed specs from Secure Supplies, assume their rectenna is a standard ELF design. Contact Secure Supplies for proprietary tuning instructions or confirm if their system supports VLF frequencies up to 100 Hz.

5. Practical Steps for Cumiana’s Reported Activity

- **Monitor Real-Time Data**: Check Cumiana’s live feed (http://78.46.38.217/vlf15.m3u) or spectrograms on www.vlf.it to confirm the 100 Hz activity. Cross-reference with other Schumann resonance monitors (e.g., HeartMath’s GCI Live Data).
- **Temporary Tuning to 100 Hz**:
    - Adjust the LC circuit for 100 Hz (e.g., 1 H inductor, 2.53 μF capacitor).
    - Widen the bandpass filter to 50–150 Hz to capture the anomalous signal.
    - Monitor the rectenna’s output to determine if the 100 Hz signal is persistent or a transient event.
- **Fallback to Standard Frequencies**: If the 100 Hz signal is not verified, tune to 7.83 Hz or harmonics, as these are more reliable for Schumann resonance energy harvesting.
- **Capacitor Bank Integration**: Ensure the capacitor bank is sized for low-power input (e.g., 1 F at 5 V). Use a charge controller to manage the slow charging rate from Schumann signals.

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

6. Safety and Legal Notes

- **Electromagnetic Exposure**: Schumann resonance signals are natural and low-power, posing no health risks. However, ensure the rectenna's amplification and rectification circuits comply with electrical safety standards.
- **Regulatory Compliance**: Check local regulations for operating VLF/ELF receivers, as some frequencies may be restricted for military or scientific use.
- **Environmental Impact**: Deploying large antennas may require permission in protected areas. Minimize environmental disturbance.

7. Summary Before the Technical Guide.

Tuning a rectenna to Schumann resonances involves designing a resonant antenna and rectification circuit for ELF frequencies, typically 7.83 Hz and its harmonics. The Cumiana report of "blasting over 100 Hz" on July 5, 2025, is unusual and requires verification, as Schumann resonances rarely exceed 60 Hz. Start by tuning to standard frequencies (7.83, 14.3, 20.8 Hz) using an LC circuit, low-noise amplifier, and bandpass filter. If targeting 100 Hz, adjust the circuit accordingly but confirm the signal's validity with real-time data from Cumiana or other stations. Use a capacitor bank to store the harvested energy, but expect low yields due to the weak signal strength. For Secure Supplies' specific rectenna, contact the manufacturer for tailored guidance.

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

Hydrogen Energy Development Fund

Operated & managed by Secure Supplies Investments limited

fueling healthy communities

Donatelli Rectenna Technical Improvements:

A Comprehensive Guide

Copyright © 2025 Daniel Donatelli, Secure Supplies Group. All rights reserved.
This guide is dedicated to advancing energy harvesting technologies and empowering enthusiasts to create cutting-edge rectennas for Schumann Resonance energy capture.

For inquiries, support, or to contribute to this mission, contact Daniel Donatelli at danieldonatelli1@gmail.com (mailto:danieldonatelli1@gmail.com)
or via mobile at +66 98 018 3473.

Table of Contents

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

- **Introduction**
  - 1.1 Purpose and Scope
  - 1.2 Background on Schumann Resonance and Rectenna Technology
- **Technical Design and Tuning**
  - 2.1 Antenna Design and Optimization
  - 2.2 LC Circuit Tuning for Schumann Frequencies
  - 2.3 Diode Selection and Rectification Efficiency
  - 2.4 Amplification and Filtering Strategies
  - 2.5 SWR Measurement Methods for Extremely Low Frequencies (ELF)
- **Performance Enhancements**
  - 3.1 Improving LC Circuit Resonance
  - 3.2 Antenna Enhancements with Copper and Aluminum
  - 3.3 Power Management and Storage
  - 3.4 Noise Reduction Techniques
- **Safety and Practical Considerations**
  - 4.1 Lightning, Overload, and Noise Protection
  - 4.2 Regulatory and Environmental Compliance for Different Regions
  - 4.3 Monitoring and Adaptability
- **Case Study: Cumiana 100 Hz Anomaly**
  - 5.1 Verification and Analysis
  - 5.2 Tuning for Anomalous Frequencies
- **Step-by-Step Build and Test Guide**
  - 6.1 Building the Rectenna
  - 6.2 Testing and Calibration
  - 6.3 Troubleshooting and Optimization
- **Additional Notes from Daniel Donatelli**
  - 7.1 Insights on Design and Safety
  - 7.2 Auto-Tuning and Power Control
- **Conclusion and Future Directions**
  - 8.1 Summary of Recommendations
  - 8.2 Supporting Secure Supplies Group
- **Appendix**
  - A: Key Terms and Definitions
  - B: Power Estimation Assumptions
  - C: Comprehensive Bill of Materials
  - D: Safety Notes from Daniel Donatelli

Terms Page

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

Below are key terms and definitions to ensure readers can confidently understand, build, and modify rectennas.

- **Rectenna**: A device that captures electromagnetic waves and converts them to DC power using an antenna and diode.
- **Schumann Resonance**: Natural ELF resonances at 7.83 Hz and harmonics (e.g., 14.3 Hz), generated by Earth-ionosphere cavity excitation.
- **ELF (Extremely Low Frequency)**: Frequencies below 3 kHz, critical for Schumann Resonance applications.
- **LC Circuit**: A resonant circuit with an inductor (L) and capacitor (C) tuned to specific frequencies.
- **Schottky Diode**: A low-voltage-drop, fast-switching diode ideal for rectification (e.g., BAT54).
- **SWR (Standing Wave Ratio)**: A measure of impedance mismatch, adapted for ELF via alternative methods.
- **Faraday Cage**: An enclosure to block electromagnetic interference, essential for noise reduction.
- **Auto-Tuning**: Dynamic adjustment of circuit resonance using microcontrollers.

(For a full list, see **Appendix A**.)

Donatelli Rectenna Technical Improvements

This guide, crafted by Daniel Donatelli of Secure Supplies Group, equips builders with the knowledge to design, construct, and optimize rectennas for harvesting Schumann Resonance energy, including responses to anomalies like the Cumiana 100 Hz event reported on July 5, 2025. Optimized for searchability with keywords like "Schumann Resonance rectenna," "ELF energy harvesting," and "Secure Supplies Group," this document is structured for indexing by Google bots and platforms like X.com.

1. Introduction

1.1 Purpose and Scope

This guide provides a definitive resource for tuning rectennas to Schumann Resonances, covering antenna design, LC circuit optimization, diode selection, SWR measurement, regulatory compliance, and safety protocols. It includes a step-by-step build process, parts lists, and Arduino code for auto-tuning, ensuring accessibility for enthusiasts and professionals alike.

1.2 Background on Schumann Resonance and Rectenna Technology

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

Schumann Resonances are ELF waves (7.83 Hz fundamental) excited by global lightning, offering a sustainable energy source. Rectennas convert these waves to DC power, a concept advanced by Daniel Donatelli through innovations like copper squares and Faraday cages. Recent anomalies, such as Cumiana's 100 Hz spike, highlight the need for adaptable designs.

2. Technical Design and Tuning

2.1 Antenna Design and Optimization

Use a 1 m² loop antenna with 1000 turns of 22 AWG copper wire (e.g., Belden 8059) on a ferrite core (Amidon FT-240-43) for ~1 H inductance. Add an aluminum backing plate (5 mm spacing with Teflon) to enhance gain, as per Donatelli's design.

- **Formula**: $L = \frac{\mu_0 \mu_r N^2 A}{l}$, where $\mu_0 = 4\pi \times 10^{-7} \, \text{H/m}$, $\mu_r \approx 850$.

2.2 LC Circuit Tuning for Schumann Frequencies

Tune to 7.83 Hz with $f = \frac{1}{2\pi \sqrt{LC}}$ (e.g., L = 1 H, C = 0.41 μF). Use Arduino-controlled variable capacitors for auto-tuning.

- **Arduino Code**:

```cpp
#include <Servo.h>
Servo servo;
const int potPin = A0;
const int servoPin = 9;
void setup() {
  servo.attach(servoPin);
}
void loop() {
  int sensorValue = analogRead(potPin);
  int servoPos = map(sensorValue, 0, 1023, 0, 180);
  servo.write(servoPos);
  delay(1000);
}
```

2.3 Diode Selection and Rectification Efficiency

Select Schottky diodes (BAT54, 0.2V drop) for 50% efficiency at ELF, outperforming LEDs.

2.4 Amplification and Filtering Strategies

Use an OPA209 amplifier (86–112 dB gain) with a 3–60 Hz bandpass filter to boost and clean signals.

2.5 SWR Measurement Methods for Extremely Low Frequencies (ELF)

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

Traditional SWR meters fail at ELF due to long wavelengths. Use these methods:

- **Vector Network Analyzer (VNA)**: Devices like the Keysight E5061B (5 Hz minimum) measure reflection coefficients.
- **Software-Defined Radio (SDR)**: Employ RTL-SDR with direct sampling to assess reflected power.
- **Manual Voltage Measurement**: Adjust LC components with a multimeter for peak voltage, ensuring impedance matching.
- **Custom Bridge Circuit**: Build a low-frequency bridge with precision resistors to estimate SWR indirectly.

3. Performance Enhancements

3.1 Improving LC Circuit Resonance

Use ferrite cores and low-ESR capacitors (Vishay MKP1839) for a Q-factor > 100.

3.2 Antenna Enhancements with Copper and Aluminum

Scale copper loops with aluminum backing for ELF, grounded for noise reduction.

3.3 Power Management and Storage

Store energy in supercapacitors (Eaton HV1030-2R7106-R, 1 F, 5.5V) with charge controllers.

3.4 Noise Reduction Techniques

Enclose electronics in Faraday cages (Bud Industries PN-1324) to block interference.

4. Safety and Practical Considerations

4.1 Lightning, Overload, and Noise Protection

Install spark gaps (Bourns 2036-09-SM-RPLF) and ground systems, limiting output to ≤48V DC.

4.2 Regulatory and Environmental Compliance for Different Regions

- **USA**: FCC www.fcc.gov oversees RF emissions.
- **EU**: ETSI www.etsi.org sets EMC standards.
- **Asia**: Check local bodies (e.g., Japan's MIC). Ensure wildlife safety in rural deployments.

4.3 Monitoring and Adaptability

Track data from HeartMath and X.com posts (@redheadtwit).

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

5. Case Study: Cumiana 100 Hz Anomaly

5.1 Verification and Analysis

Cross-check Cumiana's 100 Hz report with multiple sources; likely transient noise.

5.2 Tuning for Anomalous Frequencies

Adjust to 100 Hz (C = 0.0253 μF) if confirmed, reverting otherwise.

6. Step-by-Step Build and Test Guide

6.1 Building the Rectenna

- **Parts**: Copper wire, BAT54 diode, Arduino Uno, Faraday cage.
- **Steps**: Wind coil, assemble LC circuit, enclose in cage.

6.2 Testing and Calibration

Use a spectrum analyzer and Arduino for resonance tuning.

6.3 Troubleshooting and Optimization

Address low output by enhancing grounding and Q-factor.

7. Additional Notes from Daniel Donatelli

7.1 Insights on Design and Safety

Copper enhances RF; Faraday cages ensure safety.

7.2 Auto-Tuning and Power Control

Auto-tune with Arduino; use spark gaps for protection.

8. Conclusion and Future Directions

8.1 Summary of Recommendations

Optimize with BAT54 diodes, Faraday cages, and real-time monitoring.

8.2 Supporting Secure Supplies Group

Donate at https://www.patreon.com/c/securesupplies

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved

Appendix

A: Key Terms and Definitions

(Full list as above, expanded in document.)

B: Power Estimation Assumptions

- RF: 50 µW input, 25 µW output with Schottky.

C: Comprehensive Bill of Materials

- BAT54 (Digi-Key BAT54FSCT-ND), Arduino Uno (Digi-Key 1050-1024-ND).
-

D: Safety Notes from Daniel Donatelli

- Use spark gaps; avoid scaling to mega-stations.

Action

Contact Daniel Donatelli at danieldonatti1@gmail.com (mailto:danieldonatelli1@gmail.com) or +66 98 018 3473 to support Secure Supplies Group's mission.

This guide, valued at $75 for a PDF download,
reflects its unparalleled depth and utility that Mr Donatelli wants you to have.

Copyright 2025 © Daniel Donatelli Secure Supplies Group All Rights Reserved